In vitro evaluation of the competing effect of *Carnobacterium maltaromaticum* isolated from vacuum-packed beef with long shelf-life against three major food pathogens

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Foodborne disease outbreaks are one of the leading causes of infections, hospitalisations and deaths provoked by pathogenic bacteria. Biopreservation is a hurdle which consists of the use of controlled microorganisms or its metabolites to preserve food and extend its shelf-life. Carnobacteria have been studied for their bioprotective properties since they can inhibit pathogenic and spoilage microorganisms. In this way, this study aimed to evaluate in vitro the bioprotective potential of *Carnobacterium maltaromaticum* (CM) isolated from vacuum-packed (VP) beef against *Escherichia coli* O157:H7, *Listeria monocytogenes* and *Salmonella* Typhimurium. Three CM strains isolated from VP beef with long shelf-life at a temperature near the freezing point were selected. The antimicrobial effect of CM against the pathogenic bacteria cited above was evaluated in co-cultures with or without EDTA at different temperatures. The antimicrobial effect of the cell-free supernatant of CM was also evaluated. The results indicate that the selected strains have an antilisterial activity, which is optimised at low temperatures. Moreover, when the strains were combined with EDTA, it was observed a slight inhibition of gram-negative bacteria (GNB). The inhibition with the EDTA treatment was possibly due to the capacity of this compound to destabilise the outer membrane of GNB, allowing CM to act against these bacteria. Finally, the evaluation of the antimicrobial activity of cell-free supernatant of CM did not highlight any inhibition effect against the tested pathogens. Thus, the antimicrobial activity of these CM strains is not related to bacteriocin production under the studied conditions.